



Current and future disaster risk – a scientific perspective

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Floods

Italy 2018



Wildfires

California, US, 2018



Biological hazards

Ebola, DRC 2018



Earthquake

Nepal Earthquake 2015



Tsunamis

Japan, 2011

Science is advancing understanding of risk

New science

- **Better models:** Earth system, massive computing, AI
- **Better data:** big data, social data, earth observation, local/global data

New way of working together

- **Interdisciplinary partnerships**
- **Knowledge management** → e.g. European Commission Disaster Risk Management Knowledge Centre
- **Global partnerships** → e.g. UN Global Risk Assessment Framework

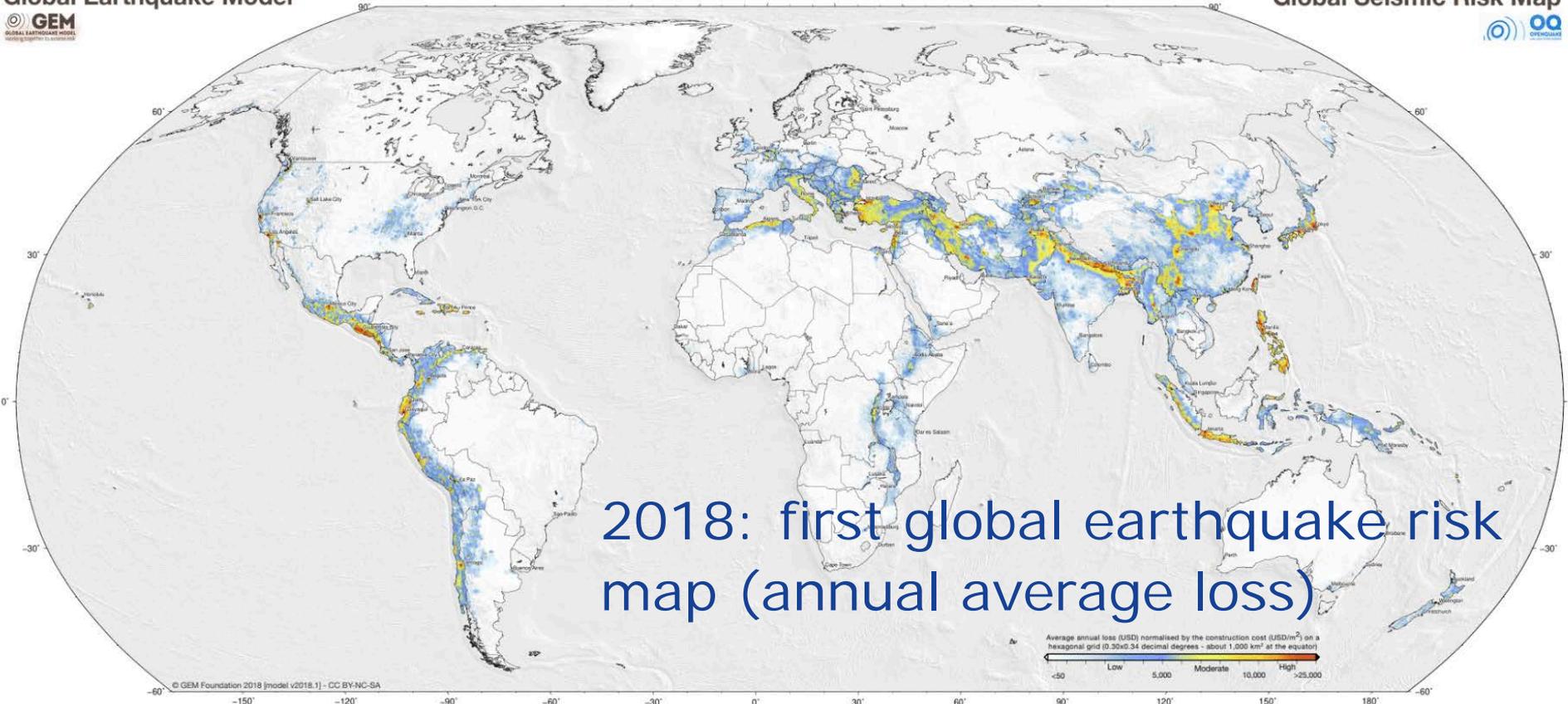


Global risk calculations are now feasible

Global Earthquake Model

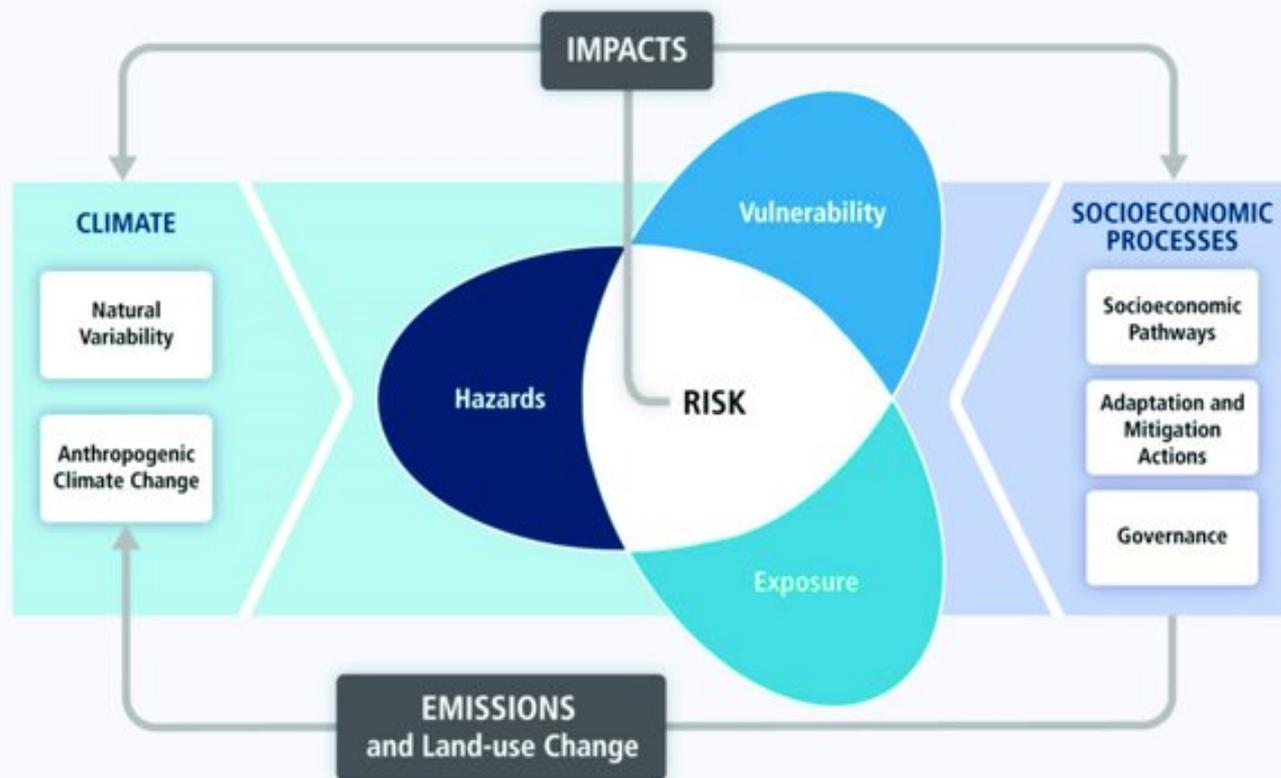


Global Seismic Risk Map



2018: first global earthquake risk map (annual average loss)

Understanding drivers of risk



Exposure: built-up and urban growth

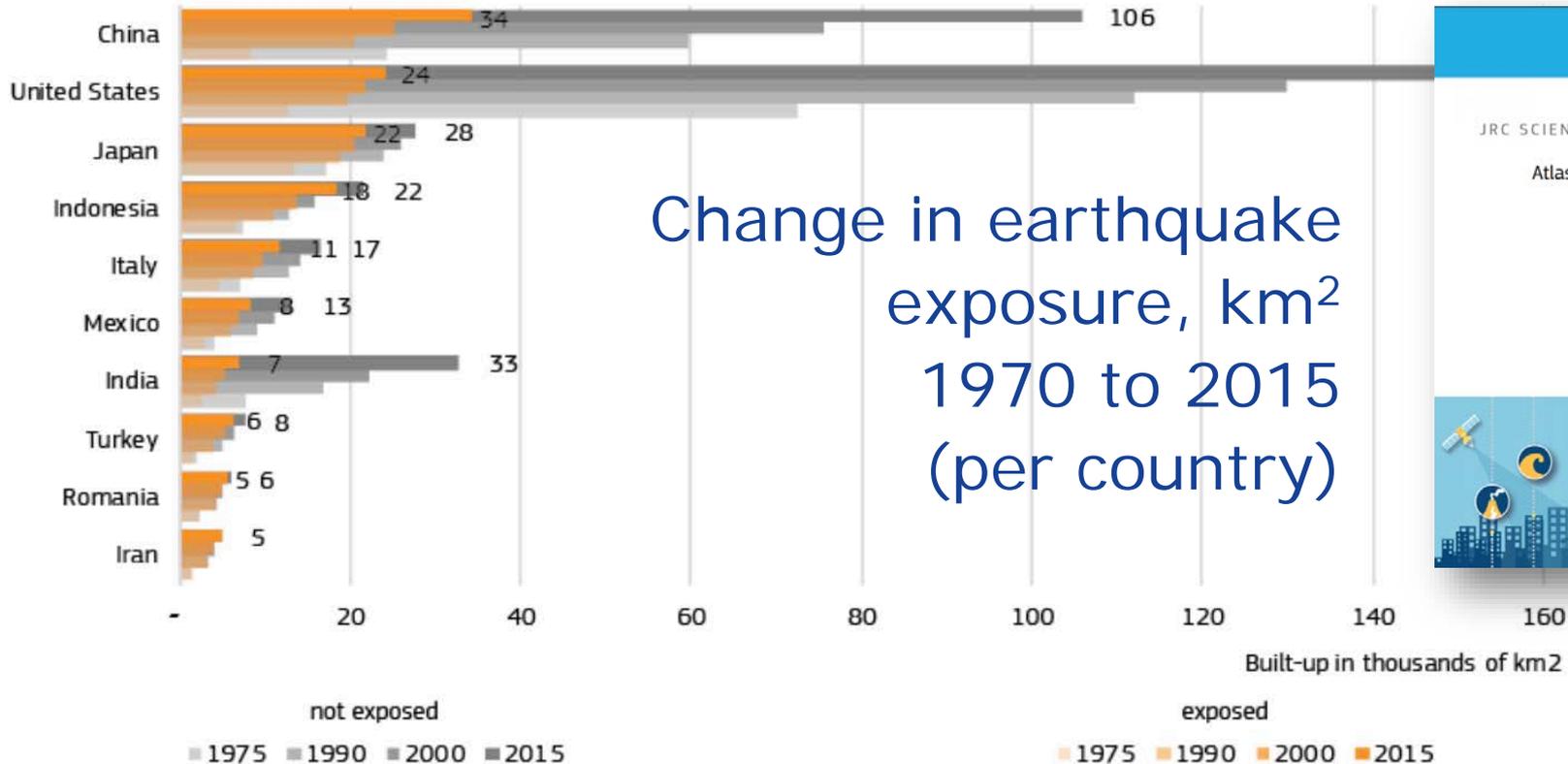
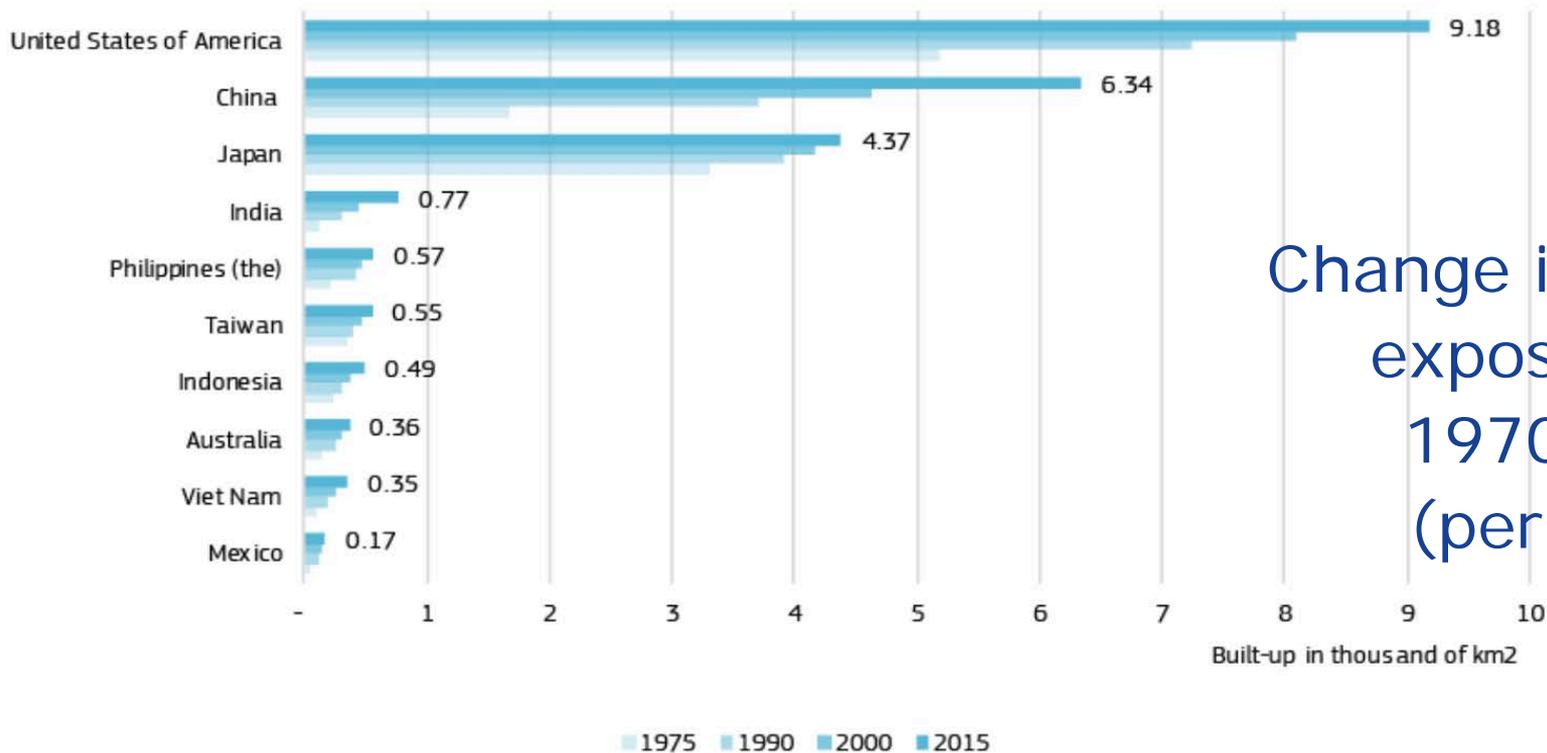


Figure 8 Ten countries with the highest amount of built-up potentially exposed to seismic hazard in 2015, compared to total built-up, 475 years RP (1975-1990-2000-2015)

Exposure: population and urban growth



Change in coastal exposure, km² 1970 to 2015 (per country)

Figure 35 Ten countries with the highest amount of built-up potentially exposed to tropical cyclone storm surge in 2015, 250 years RP (1975-1990-2000-2015)

Vulnerability: unequal distribution of risk

3 Yr trend: ↗
Socio-economic
vulnerability: **7.2**
Vulnerable groups: **7.9**

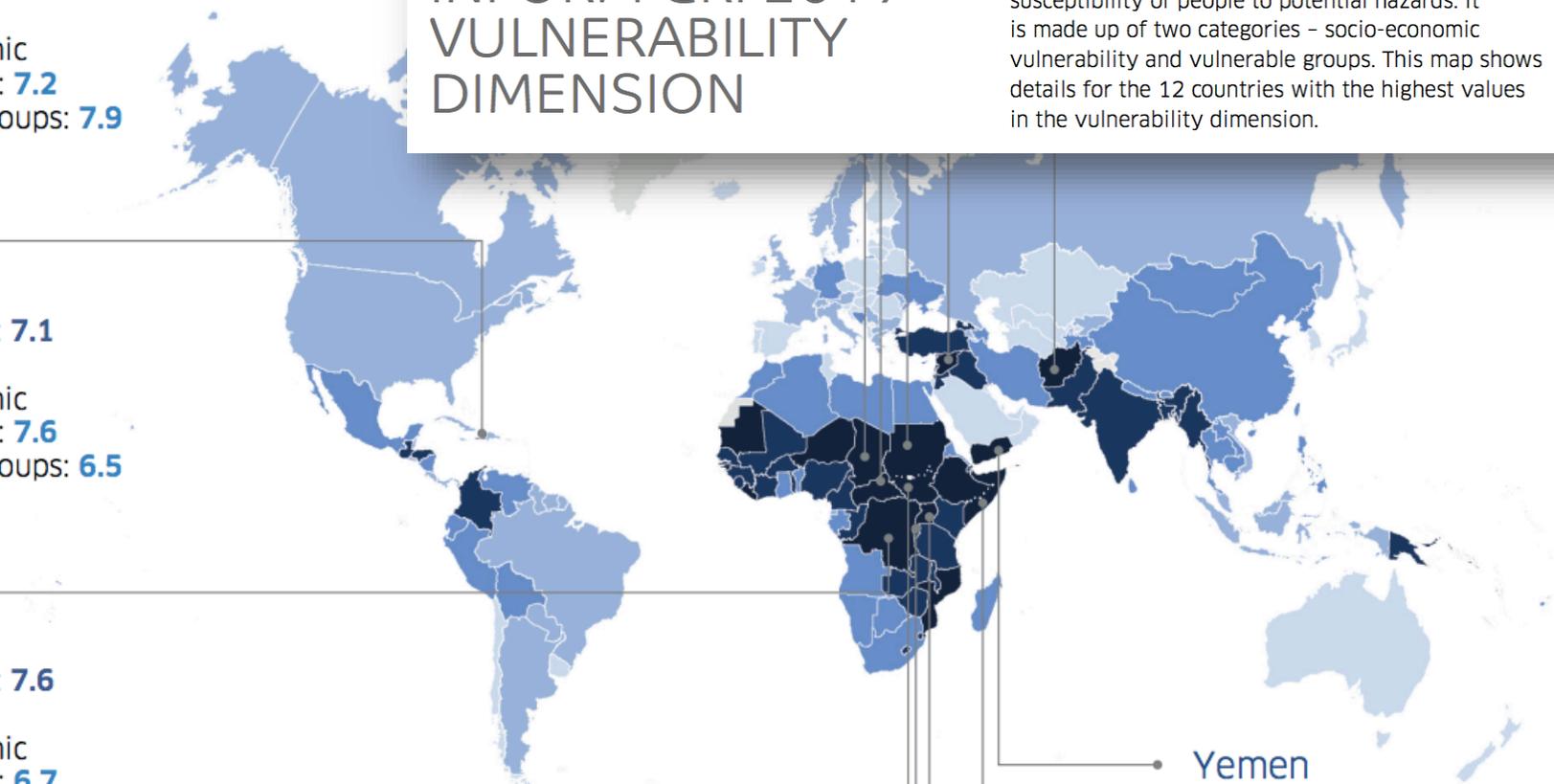
INFORM GRI 2019 VULNERABILITY DIMENSION

This dimension of the INFORM GRI measures the susceptibility of people to potential hazards. It is made up of two categories – socio-economic vulnerability and vulnerable groups. This map shows details for the 12 countries with the highest values in the vulnerability dimension.

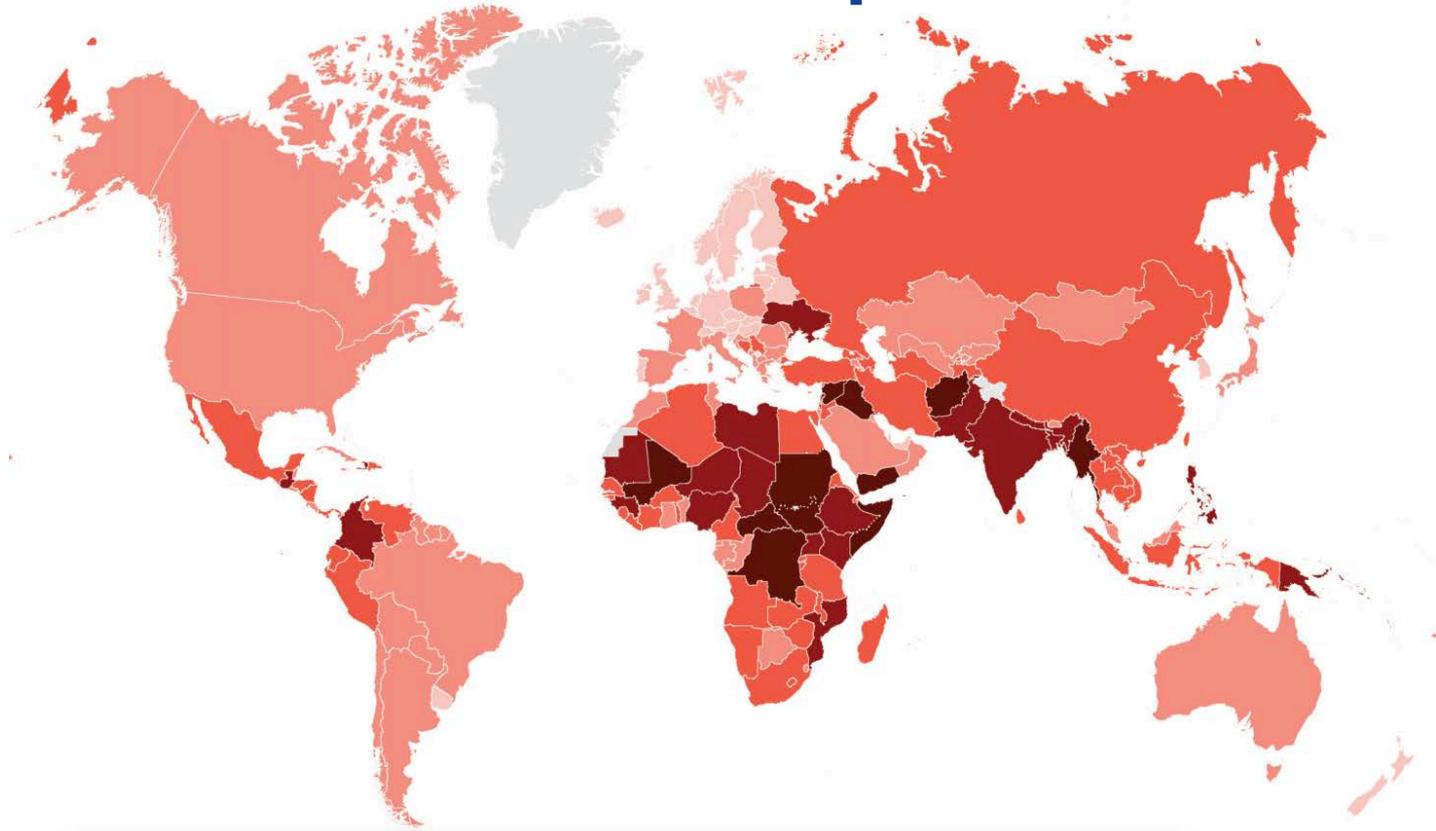
Haiti
Vulnerability: **7.1**
3 Yr trend: ↗
Socio-economic
vulnerability: **7.6**
Vulnerable groups: **6.5**

Congo DR
Vulnerability: **7.6**
3 Yr trend: →
Socio-economic
vulnerability: **6.7**
Vulnerable groups: **8.3**

Yemen
Vulnerability: **7.5**
3 Yr trend: ↘



Multi-risk tools are in full development



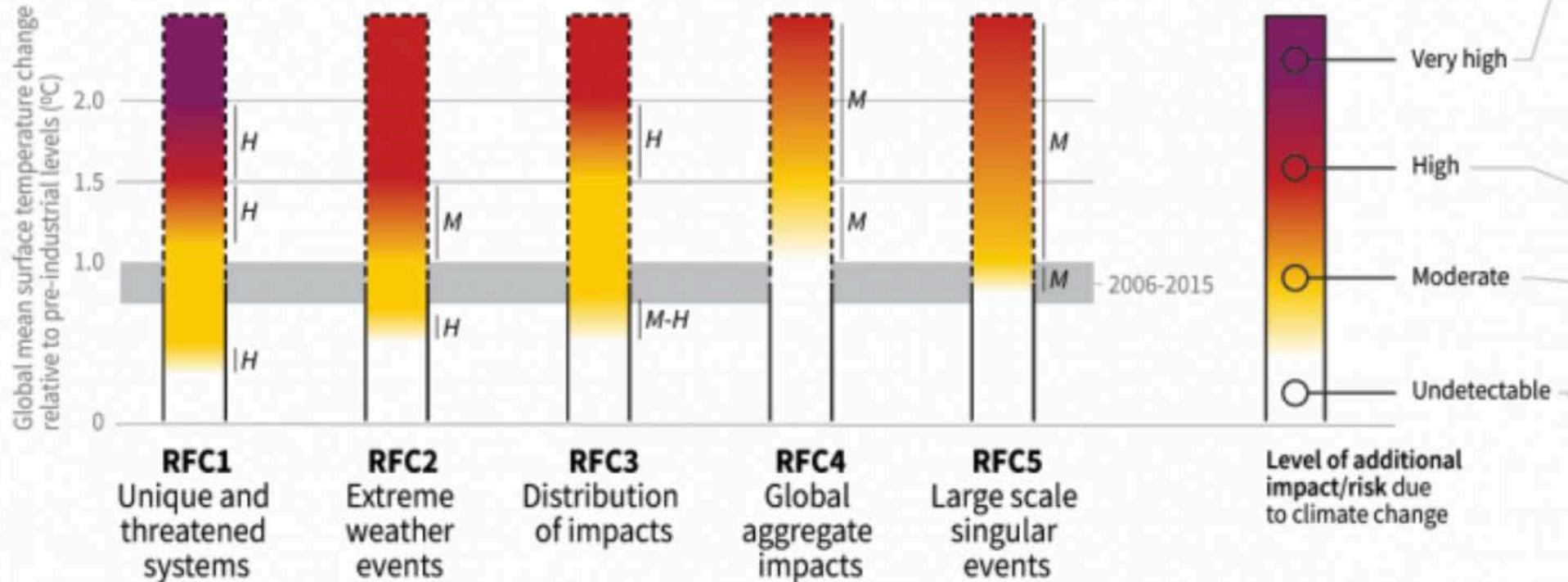
INFORM

THE INFORM GLOBAL RISK INDEX MEASURES THE RISK OF HUMANITARIAN CRISES AND DISASTERS IN 191 COUNTRIES

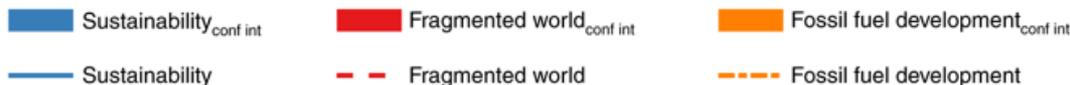
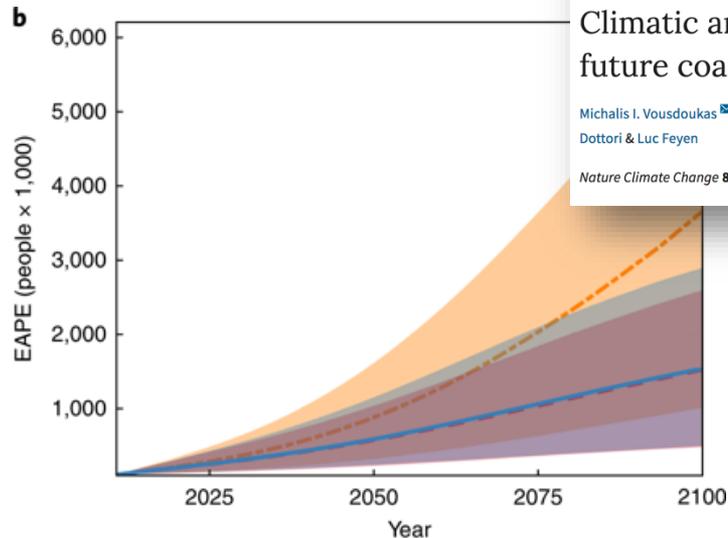
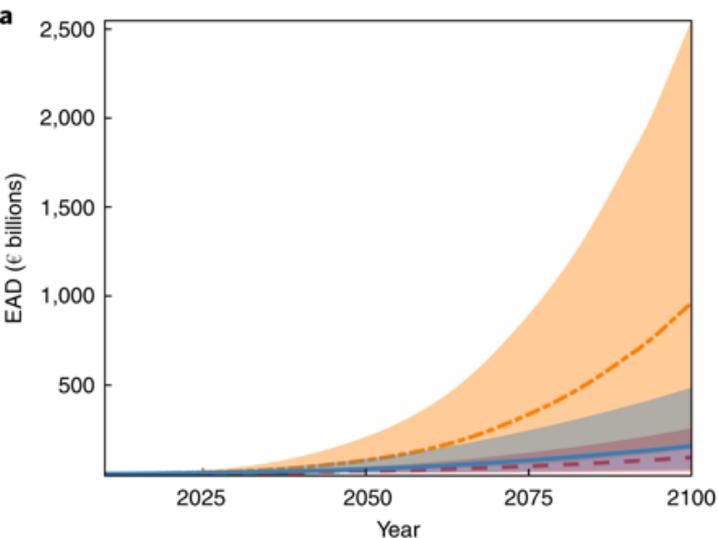


Climate is increasing disaster risk

Impacts and risks associated with the Reasons for Concern (RFCs)



Coastal risk: ports at risk



nature
climate change

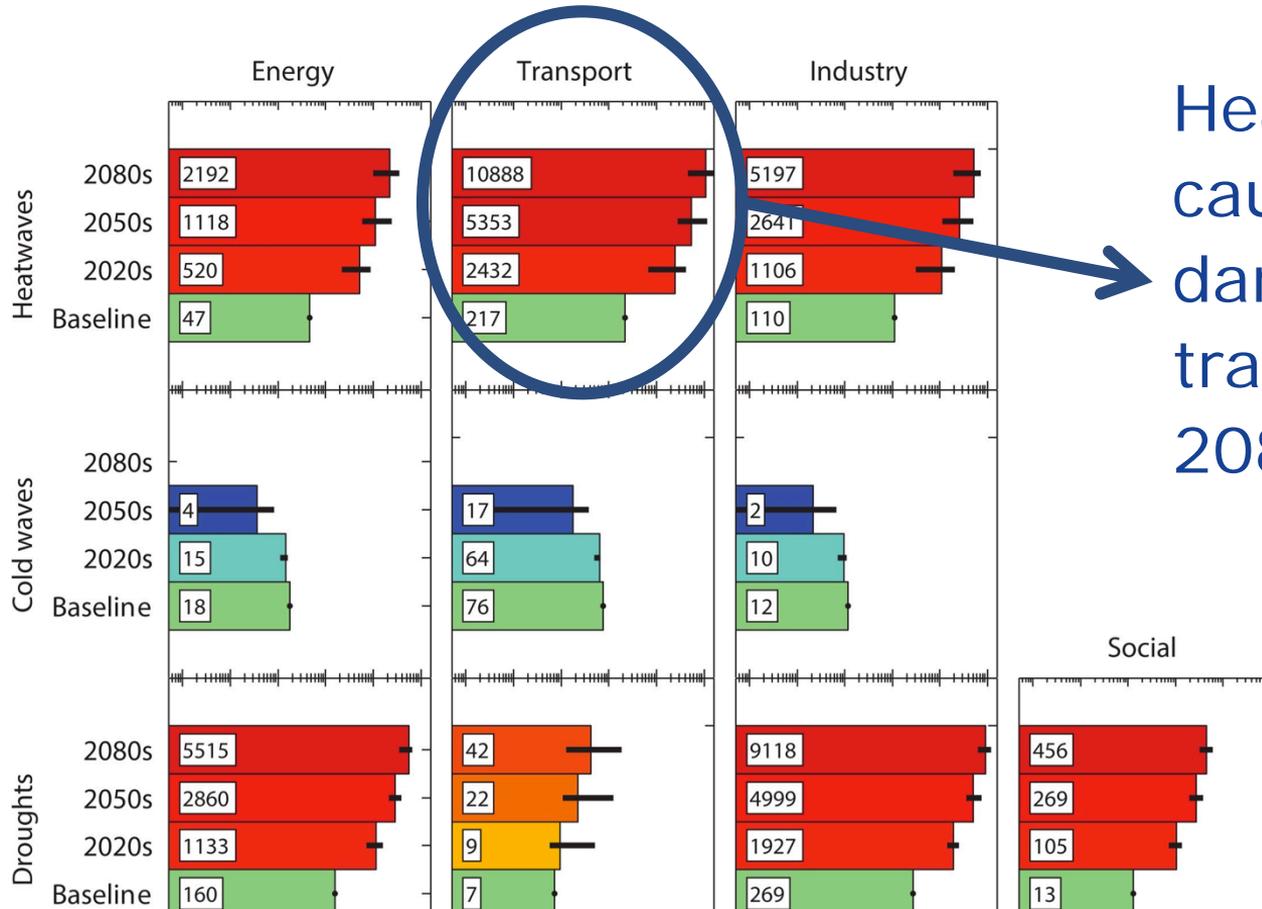
Letter | Published: 13 August 2018

Climatic and socioeconomic controls of future coastal flood risk in Europe

Michalis I. Voudoukas , Lorenzo Mentaschi, Evangelos Voukouvalas, Alessandra Bianchi, Francesco Dottori & Luc Feyen

Nature Climate Change 8, 776–780 (2018) | [Download Citation](#)

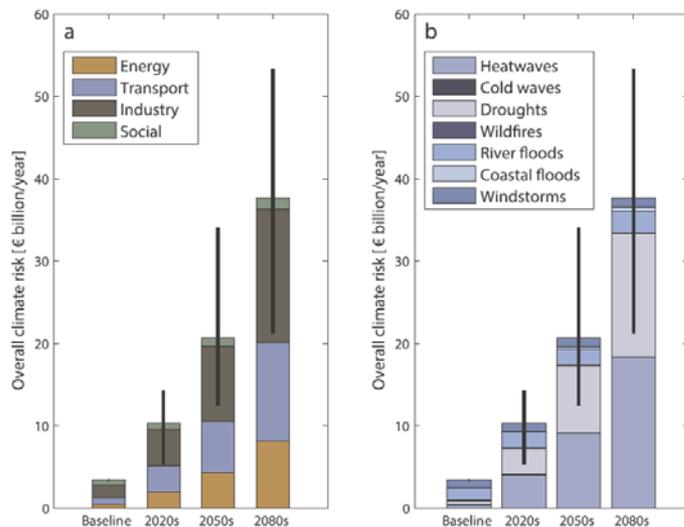
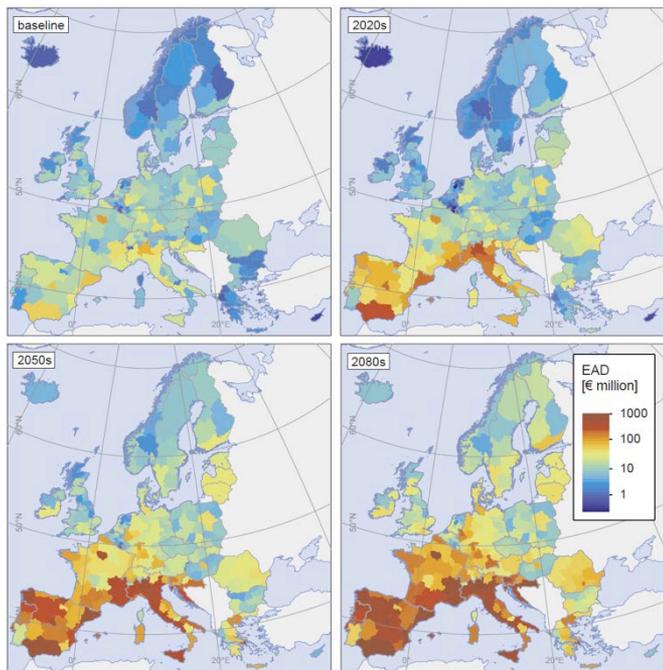
Risk is growing in all sectors



Heatwaves may cause 10.8b€/yr damage to transport by 2080 in EU

Forzieri et al., *Global Environmental Change*, 2018

Risk is increasing: critical infrastructure



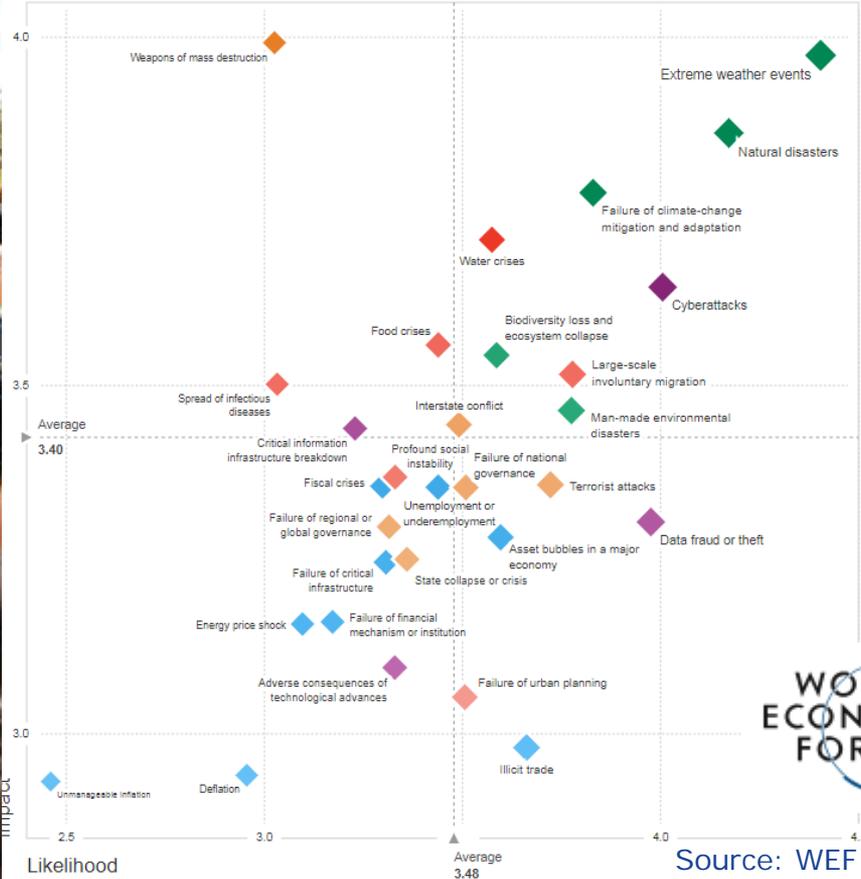
Evolution of damage from climate impacts on critical infrastructure in 21st century

Increasing damage of climate related disasters on critical infrastructure in Europe with global warming.

Regional and sectoral differences in future losses and required adaptation capacity.

Spatial distribution of climate risk for critical infrastructure in Europe in 21st century

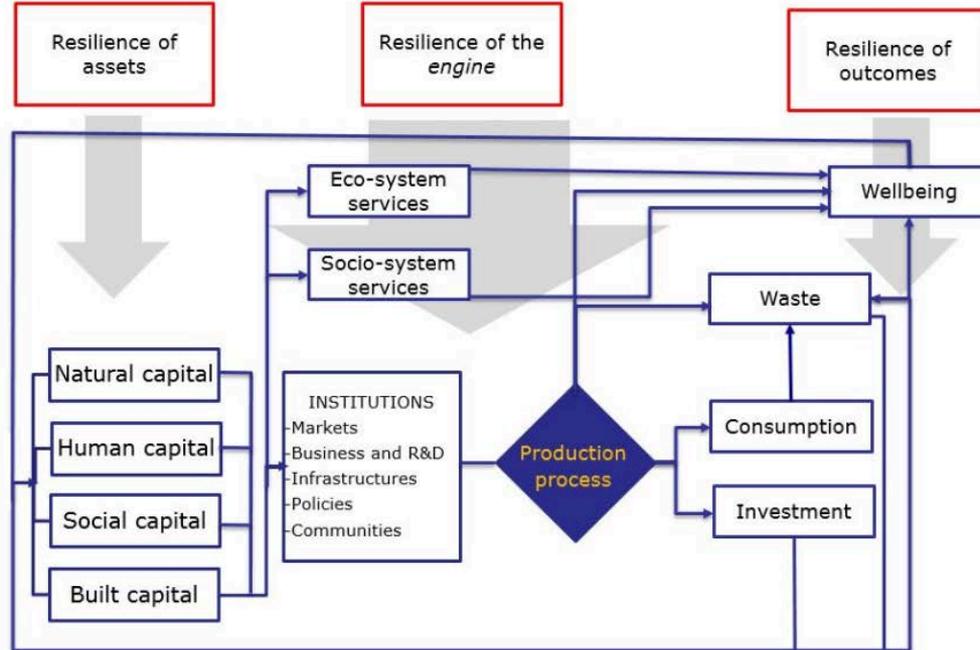
Challenges: quantifying all risks



Source: WEF

Challenges: understanding systemic risk

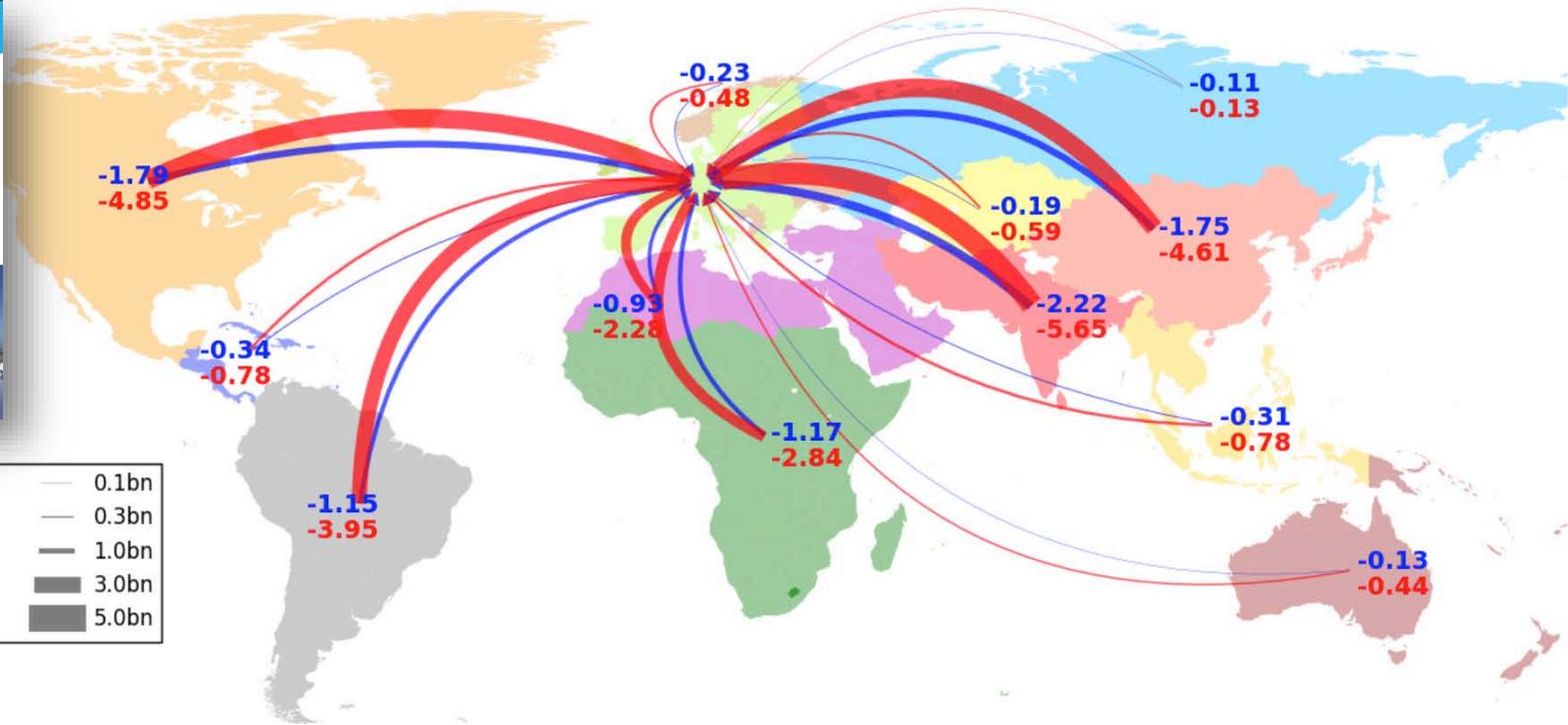
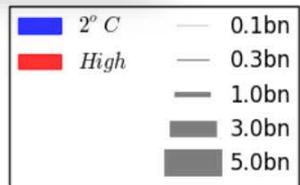
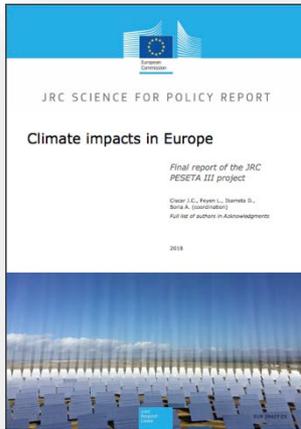
Figure 3: Ingredients of resilience in the materially closed Earth system



Capacity =
Knowledge +
Governance +
Resources



Systemic risk in trade: spill-over effects



Geography of global transboundary effects (due to climate impacts in the rest of the world, via international trade) in GDP terms (bn €)

Source: PESETA 3 study

Take away messages

- Understanding Risk is central to informed policy, also for trade
- Risk is systemic, complex and changing

